

Claims:

1. A printing system for printing a print job comprising a number of pages, the system including:

a receiving hardware interface for performing first coupling of incoming page description data, in the form of a display list, to a renderer software interface;

said renderer software interface for performing first processing of the display list to thereby output a first processed display list; and

rendering hardware, adapted to perform second processing of the first processed display list to thereby output raw pixel data, wherein:

said receiving hardware interface, the rendering software interface, and the renderer hardware are arranged to operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

2. A printing system according to claim 1, further comprising:

a host application for outputting at least one call defining said print job;

a printer driver for performing third processing of the at least one call to thereby output page description data;

a host hardware interface for performing second coupling of said page description data to the receiving hardware interface;

an interpreter, interposed between the receiving hardware interface and the renderer software interface, wherein the receiving hardware interface couples said page description data to the interpreter, said interpreter receiving and processing the coupled page description data to thereby output said display list; and

a marking engine for generating an image on an output print medium for the print job dependent upon said raw pixel data, wherein:

said host application, the printer driver, the host hardware interface, the interpreter and the marking engine are arranged to operate in a pipelined manner, being

thereby capable of concurrently processing job data from at least one page of the print job.

3. A printing system according to claim 2, wherein said one call comprises a GDI call in a Windows™ operating system.

4. A printing system according to claim 2, wherein a spooler and a port monitor are interposed between the printer driver and the host hardware interface, wherein:

said spooler couples the page description data output from the printer driver to the port monitor; and

the port monitor couples the page description data output from the spooler to the host hardware interface, and wherein a colour converter and an output processor are interposed between the rendering hardware and the marking engine, wherein:

the colour converter converts the raw pixel data being represented in a first colour space to converted raw pixel data being represented in a second colour space, said converted raw pixel data being provided to the marking engine instead of the raw pixel data, wherein

said spooler, the port monitor, and the colour converter are arranged to operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

5. A printing system according to claim 4, wherein at least one of the spooler and the port monitor is implemented in software.

6. A printing system according to claim 1, wherein said rendering hardware has a display list memory for storing the first processed display list.

7. A method of data processing for a printing system adapted for printing a print job comprising a number of pages, said method comprising steps of:

first coupling, by a receiving hardware interface, of incoming page description data to a renderer software interface in the form of a display list;

performing first processing, by the renderer software interface, of the display list to thereby output a first processed display list; and

performing second processing, by rendering hardware, of the first processed display list to thereby output raw pixel data, wherein:

said first coupling, said first and said second processing steps operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

8. A method according to claim 7, comprising further steps of:

outputting, by a host application, at least one call defining said print job;

performing third processing, by a printer driver, of the at least one call to thereby output page description data;

second coupling, by a host hardware interface, said page description data to the receiving hardware interface;

interpreting, by an interpreter, the incoming page description data coupled from the receiving hardware interface, to thereby output said display list; and

generating, by a marking engine, an image on an output print medium for the print job dependent upon said raw pixel data, wherein:

said outputting, third processing, second coupling, interpreting and generating steps operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

9. A method according to claim 8, wherein said one call comprises a GDI call in a Windows™ operating system.

10. A method according to claim 8, comprising further steps of:

third coupling, by a spooler, the page description data output from the printer driver to a port monitor;

fourth coupling, by the port monitor, the page description data output from the spooler to the host hardware interface;

5 storing, by a display list memory, the first processed display list for outputting to the rendering hardware;

converting, by a colour converter, the raw pixel data being represented in a first colour space to converted raw pixel data being represented in a second colour space, said converted raw pixel data being provided to the marking engine instead of the raw pixel data, wherein

10 said third and fourth coupling steps, the storing and the converting steps operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

15 11. A method according to claim 10, wherein at least one of the spooler and the port monitor is implemented in software.

12. A computer readable medium for storing a program for a print system adapted to print a job comprising a number of pages, said program comprising:

20 code for a first coupling step for coupling, by a receiving hardware interface, of incoming page description data to a renderer software interface in the form of a display list;

code for a first processing step for processing, by the renderer software interface, of the display list to thereby output a first processed display list; and

25 code for a second processing step for processing, by rendering hardware, of the first processed display list to thereby output raw pixel data, wherein:

said code for the first coupling step, said code for the first and said second processing steps operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

13. A computer program for a print system adapted to print a job comprising a number of pages, said program comprising:

code for a first coupling step for coupling, by a receiving hardware interface, of incoming page description data to a renderer software interface in the form of a display list;

code for a first processing step for processing, by the renderer software interface, of the display list to thereby output a first processed display list; and

code for a second processing step for processing, by rendering hardware, of the first processed display list to thereby output raw pixel data, wherein:

said code for the first coupling step, said code for the first and said second processing steps operate in a pipelined manner, being thereby capable of concurrently processing job data from at least one page of the print job.

14. A method of data processing for a printing system which comprises a sequence of pipeline processes, said method comprising, for a current pipeline process, steps of:

reading input data from an upstream pipeline process;

operating upon said input data if an internal buffer of said current pipeline process is not full;

stalling said upstream pipeline process, if said internal buffer is full; and

writing said input data, having operated thereupon, to a downstream pipeline process, if said downstream pipeline process is not stalling said current pipeline process.

15. A method according to claim 11, wherein said operating step comprises at least one of:

processing said input data; and

storing said input data.

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16. A method according to claim 11, wherein said sequence of pipeline processes comprises at least one hardware process and one software process.

17. A method according to claim 11, wherein said operating step associated with each process in said sequence of pipeline processes is performed substantially concurrently, by all processes in said sequence.